Reg. No. | | | | | | | | | | | | |

Question Paper Code : 57157

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Civil Engineering

CE 6403 – APPLIED HYDRAULIC ENGINEERING

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What is specific energy and what is the condition for getting only one depth for a given specific energy ?
2. What are the various types of flow in open channels ?
3. Distinguish between drawdown and backwater curve.
4. What are the uses of formation of hydraulic jump in a channel ?
5. What are surges in an open channel flow ?
6. Define: Impulse momentum principle.
7. How would you classify turbines based on the direction of flow in the runner ?
8. Draw typical velocity triangles for inlet and outlet of pelton wheel.
9. Define Negative slip.
10. What is manometric head ?

PART – B (5 × 16 = 80)

11. (a) (i) The specific energy for a 3 m wide channel is 8 Nm/N. What is the maximum possible discharge in the channel ? **(8)**

(ii) Show that in a rectangular channel, maximum discharge occurs when the flow is critical for a given value of specific energy. **(8)**

OR

(b) (i) How are the flows classified under specific energy concepts ? **(6)**

(ii) A 8 m wide channel conveys 15 cumecs of water at a depth of 1.2 m. Determine Specific energy of the flowing water, critical depth, critical velocity, min specific energy Froude number and state whether the flow is sub-critical or super critical. **(10)**

12. (a) (i) Show that the hydraulic radius is half the flow depth for the most economical trapezoidal channel section. **(8)**

(ii) Determine the most economical rectangular section of a rectangular channel carrying water at the rate of 0.6 cumecs . The bed slope of the channel is 1 in 2000. Assume Chezy's constant C = 50. **(8)**

OR

(b) (i) A river 100 m wide and 3 m deep has an average bed slope of 0.0005. Estimate the length of Gradually Varied Flow profile produced by a low weir which raises the water surface just upstream of it by 1.5 m. Assume N = 0.035. Use direct step method with three steps. **(8)**

(ii) A rectangular flume 2 m wide discharges at the rate of 2 m^3/sec. The bed slope of the flume is 1 in 2500. At a certain section the depth of flow is 1 m. Calculate the distance of the section downstream where the depth of flow is 0.9 m. Solve by single step method. Assume rugosity coefficient as 0.014. **(8)**

13. (a) (i) What is a hydraulic jump ? List the assumptions made in the analysis of hydraulic jump. Explain its classification. **(10)**

(ii) Water flow from an under sluice in to a very wide rectangular channel. The channel has a bed slope of 1 in 1000. The sluice is regulated to discharge $6m^2$ / sec/ m width of the channel, the depth of recontracts being 0.5 m. Will hydraulic jump form ? If so at what location ? Take Mannings constant n = 0.015. **(6)**

OR

(b) (i) A spillway discharges a flood flow at a rate of 7.75 cumecs/m width. At the downstream horizontal apron the depth of flow was found to be 0.5 m. What tail water depth is needed to form a hydraulic jump ? If a jump is formed, find its length, type, head loss and energy loss as a percentage of the initial energy. **(10)**

(ii) Discuss the types of surges briefly. **(6)**

14. (a) (i) A pelton wheel is required to develop 8825 kW when working under the head of 300 m. The speed of the pelton wheel is 540 r.p.m. the coefficient of velocity is 0.98 and the speed ratio is 0.46. Assuming jet ratio as 10 and overall efficiency as 84 %, determine :

(1) the no. of jets

(2) the diameter of the wheel

(3) the quantity of water required **(10)**

(ii) Write briefly about the classification of turbines. **(6)**

OR

(b) A jet of water having a velocity of 30 m/s strikes a series of radial curved vanes mounted on a wheel which is rotating at 300 rpm. The jet makes an angle 30° with the tangent to the wheel at inlet and leaves the wheel with a velocity of 4 m/s at an angle of 120° to the tangent of the wheel at outlet. Water is flowing from outward in a radial direction. The outer and inner radii of the wheel are 0.6 m and 0.3 m respectively.

Determine : (i) vane angles at inlet and outlet (ii) work done per second per kg of water (iii) efficiency of the wheel **(16)**

15. (a) What is a reciprocating pump ? Describe the principle and working of a reciprocating pump with a neat sketch. **(16)**

OR

(b) A three stage centrifugal pump has impellers 400 mm in diameter and 200 mm wide at outlet. The vanes are curved back at the outlet at 45° and reduce the circumferential area by 10%. The manometric efficiency is 90% and overall efficiency is 80%. Determine the head generated by the pump when running at 1000 rpm delivering 50 lps. What should be the shaft horse power ? **(16)**
